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ABSTRACT

This report describes a two-phase study designed to (1) investigate the appropriate evaluation literature and develop a formative evaluation model; (2) investigate the formative evaluation procedures utilized by Advanced Systems Incorporated (ASI), a successful producer of training materials; (3) develop a model based upon these procedures; and (4) compare and contrast the two resultant models for commonalities and differences. Results are reported from both a literature review on current formative evaluation procedures and theory and second-phase data gathering, which involved observation of evaluation procedures, extensive visitation, and an in-house survey of ASI employees involved in the product development process. An outline combines elements of education, military training, and industrial training into a single paradigm. Nine conclusions and recommendations for study applications and for further research are included. Sixty-seven references are listed, and elements of the models discussed are illustrated with numerous charts. (LMM)

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FORMATIVE EVALUATION IN INSTRUCTIONAL DESIGN: THEORY VERSUS PRACTICE

BY

JOHN A. WILLIAMS, JR.

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INTRODUCTION

Technological advances and new devices have been introduced to the world community at an ever increasing rate since the turn of the century. In order to properly understand and operate these new technologies, personnel training has become increasingly important. Within this domain, a systematic approach of monitoring the effectiveness of instructional training has been developed termed formative evaluation.

Leslie Briggs (1974) defined formative evaluation as "tryouts and revisions of components of an instructional system before operational use. It includes tryouts of materials with individual learners and small groups, as well as with entire classes in the school situation" (Briggs, 1974, p.288).

The application of formative evaluation procedures has gained increasing support in the educational community, provoking an observable trend toward the use of this technique, reflected in events such as:

1. The incorporation of formative evaluation as a main step in almost all models used for the systematic design of instruction (Branson, Raynor, Coe, Turman, King, and Hannum, 1975; Briggs, 1970; Briggs and Gagne, 1974; Dick and Carey, 1978).

2. The abundance of articles and books proposing differing methods for formatively evaluating instructional materials (Abedor, 1972; Baker, 1974; Borich, 1974; Briggs and Gagne, 1974; Dick and Carey, 1978; Kaufman and Thomas, 1980; Sanders and Cunningham, 1970; Singer and Dick, 1974).

3. Increasing interest in reporting evaluation studies,' their strategies and results (Abedor, 1972; Baker, 1974; Bank and Fink, 1976; Dick, 1968; Lawson, 1974; Light and Reynolds, 1972; Lindvall and Cox, 1970; Markle, 1967).

Important early researchers in the history of educational technology, such as Dale, Kinder, Hoban, Lazarfeld, Lumsdaine and Carpenter "unanimously supported the value of and need for evaluation during production of instructional materials" (Cambre, 1978, p. 2).

In a study conducted in 1974, out of "300,000 commercial instructional materials available at that time, only about 3,000, or one percent, 'demonstrated one or more of the attributes of empirically developed and improved material'" (Komoski, 1974, p. 357).

In Popham's view (1970), the research related to curriculum development suffered from serious deficiences. He indicated, neither improvement of materials based on empirical data, nor the manner in which revisions could be made have been clearly demonstrated.

Besides limited empirical evidence supporting formative evaluation models - other problems exist that act as a constraint to its usage.

1. There is a lack of accepted definitions (Baker and Alkin, 1973; Sanders and Cunningham, 1970).

2. During the instructional design process, formative evaluation is attempted primarily after the prototype has been developed. There is extensive analysis; however, there are usually no checks for validity, reliability, or suitability of the product.

3. Gephart (1970) indicated that although various models exist, one step invariably seems to be missing. This refers to what to do with the data after it has been collected.

4. Most of the formative evaluation models currently utilized have not been empirically tested (Martelli, 1979). The problem of formative evaluation models which are lacking empirical support has been discussed by Smith and Murray (1975), who indicated that: "there is little or no information about the relative efficiency of alternative evaluation techniques and, therefore, there is a need for evaluation research on the models themselves" (p. 5).

A recent article by David Forman stated that "in the field of training, evaluation is rarely conducted" (Aversa and Forman, 1978, p. 16-18). He also stated that there were three reasons for this state of affairs:

1. Unlike education, a great deal of training occurs in the private, as opposed to the public sector. Since the government and public foundations are not supporting these training programs, they cannot mandate evaluations.

2. There is a general feeling that educational methods are not often well-suited to the real, everyday, outcome-oriented world of business. These people tend to distrust educational methods and techniques borrowed without adaption and revision; they want training evaluation to develop a character of its own.

3. The field of training is in a state of tremendous growth and development. The demand for training is great, and trainers are thinking more about developing their next project as opposed to evaluating and improving their present one.

Statement of the Problem

There was a need for the development of a formative evaluation paradigm gleaned from the literature which would be applicable to the educational, as well as the industrial setting, and would provide information for the advancement of knowledge about the instructional process.

Purpose of the Study

The purpose of this study, therefore, was to:

1. Investigate the appropriate evaluation literature and develop a formative evaluation model. 2. Investigate the formative evaluation procedures utilized by Advanced Systems, Incorporated and develop a model based upon these procedures. 3. Compare and contrast the two resultant models for commonalities and differences.

Research Questions

One means of investigating this particular issue of theory versus practice was to focus upon one successful producer of training materials (Advanced Systems, Inc.), in an effort to discover how closely the formative evaluation techniques are related to actual standards preset by the training corporation. Through detailed analysis of actual procedures in a major production entity, some insight into the question of formative evaluation procedures was gleaned.

In order to complete this task, the researcher answered four specific questions:

1. What is the current state of formative evaluation theory as developed in past and present professional literature?

2. What is the procedure of formative evaluation utilized by Advanced Systems, Inc., and what are the results of this procedure?

3. What is the relationship between existing formative evaluation theory and formative evaluation of training materials and programs as reflected in the comparison of (1) and (2)?

4. What conclusions can be reached as a result of this comparison?

Research Procedure and Design

In order to complete the preceding tasks, a case study approach was utilized, combined with an extensive review of the literature. The research was divided into two distinct phases. The first phase involved a literature review of current formative evaluation procedures and theory. An attempt was made to identify noted authorities through indices, computer data bases, bibliographic data, and primary as well as secondary sources related to the problem. After sufficient data was gathered using these tools, a formative evaluation model was generated based upon the general state of the art derived from the literature. This model served as a basis of comparison for the procedures and resultant model utilized by Advanced Systems, Inc. This was accomplished through a description of the systems in use today. Following this description, the two approaches were analyzed for similarities and/or differences. The final end product of this particular phase was a model based on existing theory, suitable for comparison with a model derived from procedures used by Advanced Systems, Inc.

The second phase of the research consisted of gathering data through observation of evaluation procedure and through extensive visitation and an in-house survey of ASI employees involved in the product development process. Initially, any printed material relevant to product development and partic-

dually formative evaluation was searched out and analyzed. An in-house survey was distributed to further verify these procedures and to ascertain employee attitudes in regard to the product development process.

Background

Until 1968, International Business Machines (IBM) was the dominant force in the training of employees in the utilization of computer technology, simply because they provided free training with the purchase of a computer. Sometime later, corporations were required to pay for training, and at this juncture, three individuals left IBM to form their own corporation to provide training in data processing.

The initial method of instruction was stand-up lecture. The three individuals were intrigued by video, and soon began to videotape their instruction and sell their videotapes.

In 1970, the corporation was named Advanced Systems, Incorporated, which then provided training by videotaping stand-up lectures with the support of IBM training manuals. From 1970-1973, Advanced Systems, Inc., developed an approach to instruction that produced a packaged product: a staged presentation supported by textual materials including illustrations, exercises, performance objectives and summative evaluation (Westgaard, 1981).

In 1975, ASI grossed $3,000,000, employed 250 personnel, and grew to 14 domestic as well as 7 foreign offices. In 1980, ASI grossed $35,000,000, employed 400 personnel and had 28 domestic offices and 32 foreign offices (Annual Report, 1980).

The reasons for this growth rate were threefold: 1. The result of a quality control process. 2. A tightening up of student evaluation procedures. 3. Improvement in information presentation techniques, including video scripting, front-end analysis, instructional design and instructional packaging (Westgaard, 1981).

Contemporary Evaluation Models

The models for evaluation which were described differed from descriptions of actual evaluations in the following ways: no actual program, curriculum or material were evaluated in the model; no specific contents, situations, or contexts were considered and the level of generality was high; generally, no specific instruments, designs, or mechanisms for data collection, analysis, etc., were considered; the special problems which arose in a particular study could not approached in the evaluation model. There were, however, important ways in which the evaluation model represented the actual evaluation studies which it modelled: the stages and components of the actual evaluation were ac-

curately reflected in the model; the types of relationships and data which were analyzed in the evaluation were carefully represented in the model; the general plan and strategy of evaluation which were used in the study can be clearly portrayed in the model.

Comparison - Evaluation approaches in Education and Training

Eleven evaluation design systems were presented in detail covering the mid-1960's to the present. For purposes of the research, it was vital to establish their similarities and differences by comparing and combining the various designs and stages into a single comprehensive design.

The Combined Educational and Training Evaluation Paradigm

The dissertation was a discussion of formative evaluation in three domains; education, military training and industrial training. The next segment of the discussion will consist of an outline combining the three areas, with assistance being provided in the identification of contributions by "placing an 'E' for education, 'I' for industry/military, or 'EI' for mutual contributions after the item or entry" (Barnum, 1979, p. 150). The entire outline for the evaluation procedure is as follows:

I. Analysis of Evaluation Requirements

A. Define and describe problem (E)

B. Analyze evaluation setting (E)

1. Needs assessment (E)

2. Focus evaluation (E)

3. Identify decision-making levels (E)

4. Identify goals (E)

5. Identify general program components (E)

6. Identify what is versus what should be (E)

7. Describe package components (E)

C. Plan the evaluation activities (E)

1. Evaluate needs (E)

2. Project decision alternatives (E)

3. Define decision criteria (E)

4. Define policies (E)

5. Identify the following: (E)

a. Longitudinal effects (E)

b. High payoff transactions (E)

c. Entry level behavior and characteristics (E)

6. Prioritize needs (E)

7. Select needs for action (E)

8. Abstract project (E)

9. Determine intents from (I)

a. Planners (I)

b. Designers (I)

c. Developers (I)

10. Analyze the training environment (I)

II. Designing the Evaluation System

A. Identify evaluation objectives in terms of: (E)

1. Audiences (E)

2. Educational philosophy (E)

3. Decisions (E)

4. Subject matter (E)

5. Rationales (E)

6. Staff aims (E)

B. Perform a task analysis of objectives (I)

1. Subtasks into performance objectives (I)

2. Criterion items for each objective (I)

3. Course final exam (I)

C. Construct course evaluation instruments (I)

D. Determine curriculum outline (I)

E. Sequence objectives (I)

F. Select instructional materials (I)

G. Determine terminal outcomes (I)

H. Determine information stages (E)

1. Collection

2. Organization (E)

3. Analysis (EI)

4. Reporting (E)

I. Determine statistical method (I)

1. Descriptive statistics (I)

2. Predictive statistics (I)

3. ANOVA or ANCOVA (I)

4. Canonical correlation (I)

5. Multiple discriminant analysis (I)

6. Path analytic methodology (I)

7. Non-parametric statistics (I)

J. Analyze objectives and information (E)

1. Logical analyses (E)

2. Empirical analyses (E)

3. Prerequisites (E)

4. Measuring instruments (E)

K. Develop instructional strategy (E)

L. Determine "high and low fidelity" transactions (I)

M. Prepare first draft of (I)

1. Script (I)

2. Sketches (I)

3. Storyboard (I)

4. Materials (I)

III. Implementing the Evaluation Design

A. Determine evaluation dimensions (I)

B. Review prior to evaluation (I)

C. Conduct self-evaluation of material (I)

D. Evaluate rough draft of material (I)

E. Provide expert appraisal (I)

F. Complete internal review (I)

G. Develop natural language questions (I)

H. Check evaluation design for:

1. Pervasiveness (E)

2. Reliability (E)

3. Validity (E)

4. Credibility (E)

5. Timeliness (E)

I. Administer initial evaluation (EI)

1. Individual trial (one-to-one) (EI)

2. Pilot test (E)

3. Formative interim (E)

J. Revise and recycle (EI)

K. Conduct group trial (EI)

L. Revise and recycle (EI)

M. Field test (EI)

1. Formative product (E)

2. Goal free (E)

N. Revise (E)

O. Prepare final form

1. Scripts (I)

2. Storyboard (I)

3. Visuals (I)

4. Master tape (I)

P. Operational tryout (E)

Q. Analyze evaluation data (E)

1. Program outcomes (E)

2. Relationships and indicators (E)

3. Judgements (E)

4. Objectives met (E)

5. Unexpected results (E)

6. Utilization plan (E)

R. Revise as necessary - long term (E1)

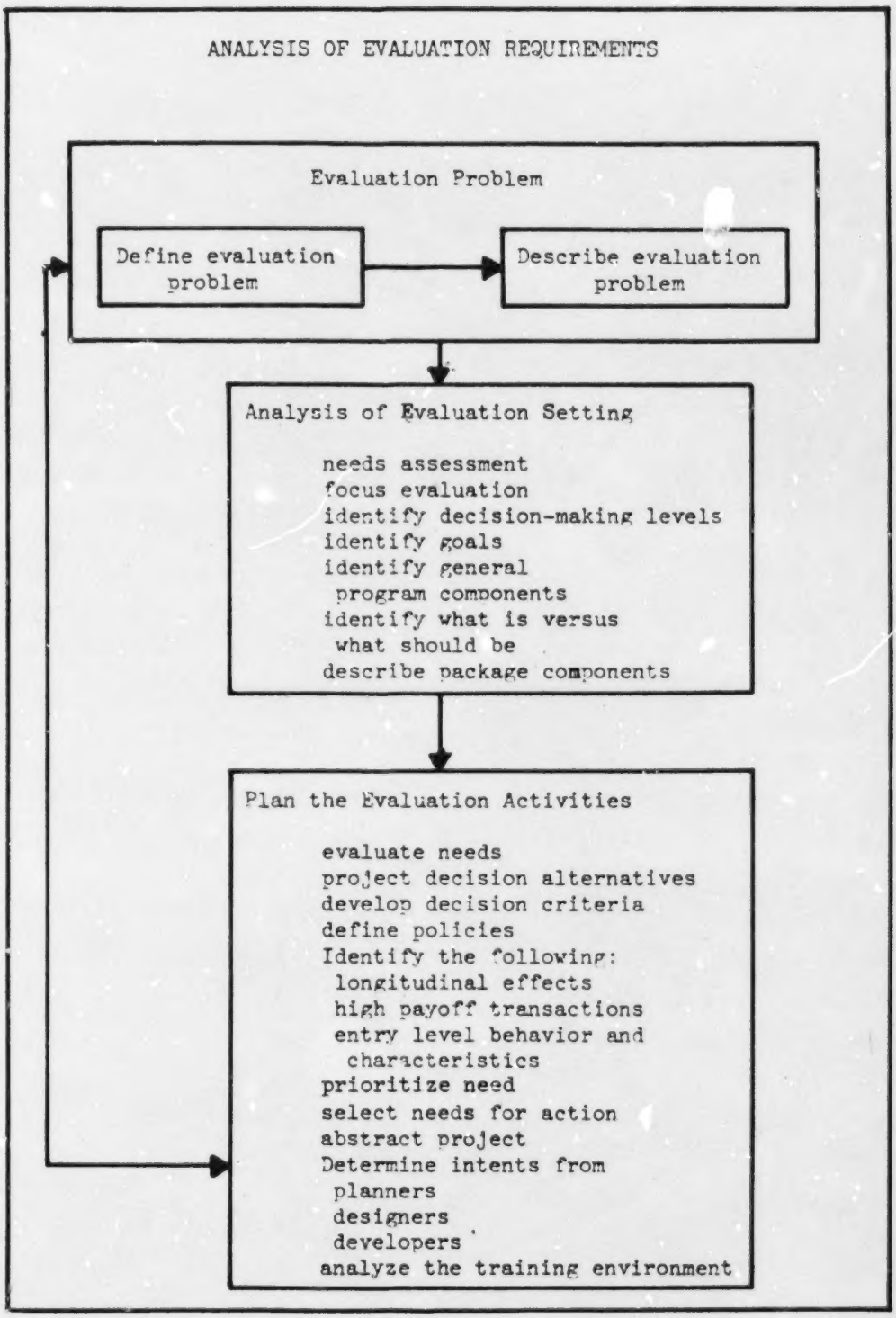
The final flowchart design representative of the evaluation process, and based upon the outline, is presented in figures 1, 2, and 3.

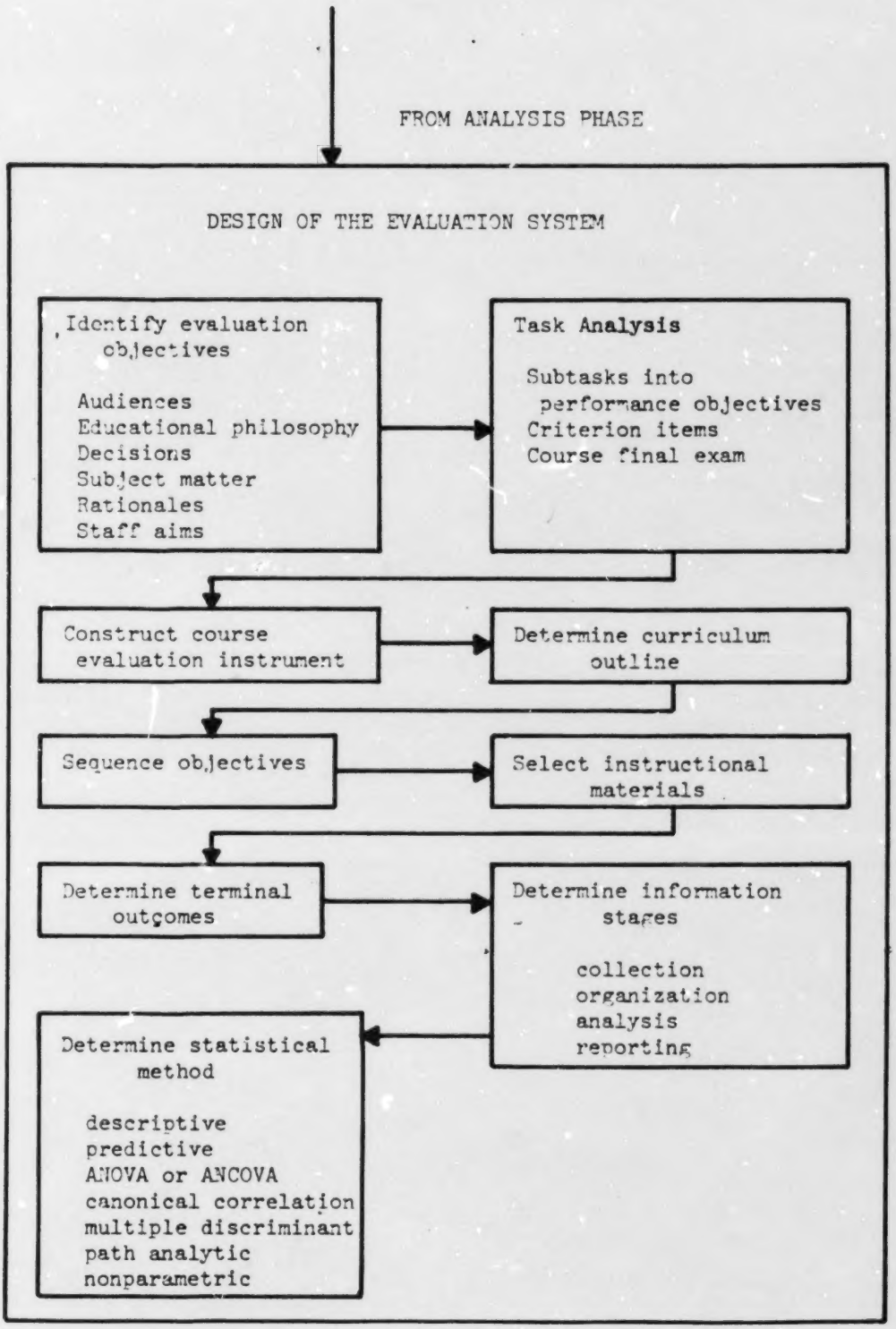
Summary

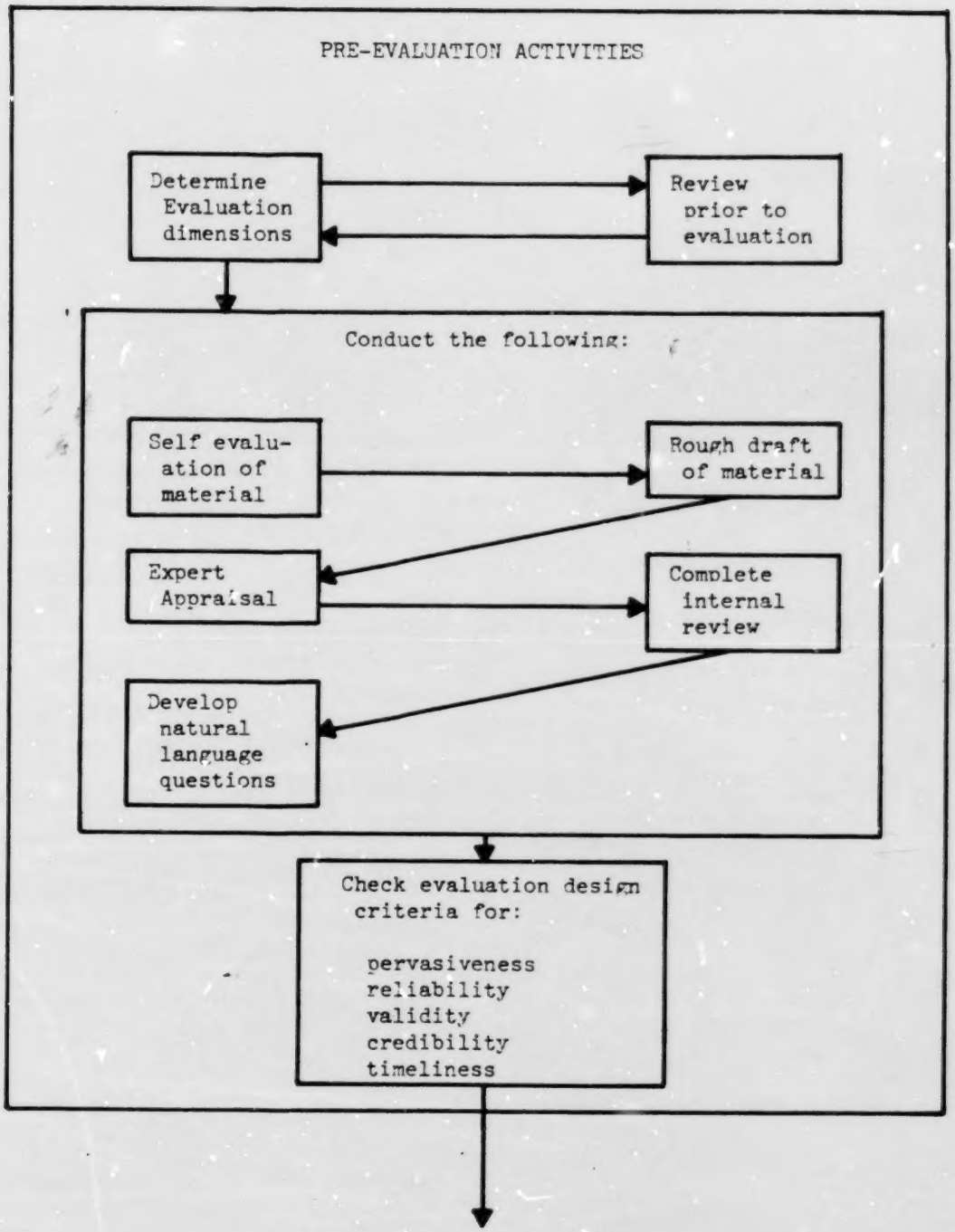
Several evaluation systems representative of the educational, industrial and military domains were presented in great detail. Within each of the various domains, the individual schemata of evaluation were analyzed for consistent and unique characteristics that were useful in the development of a comprehensive evaluation system.

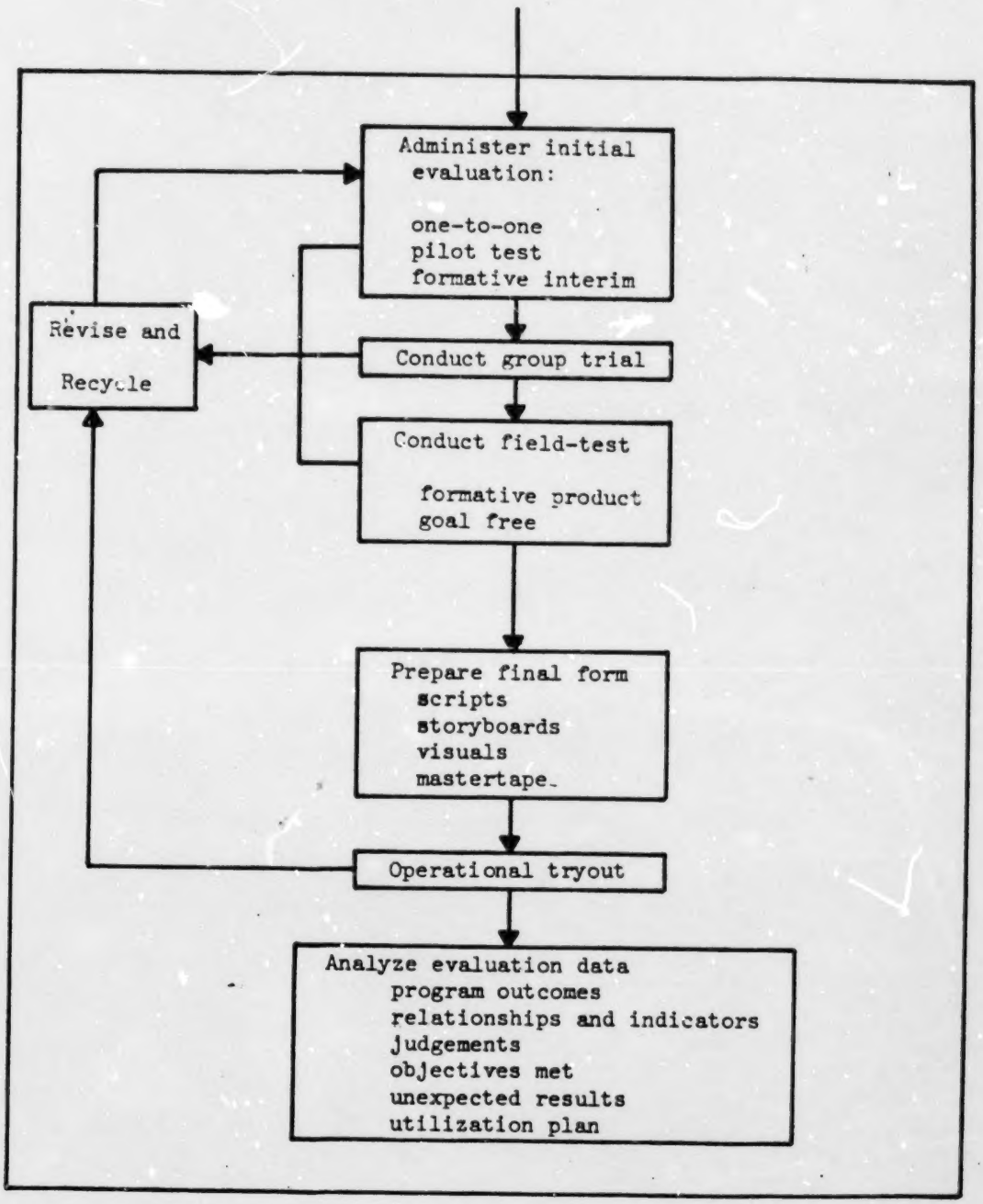
The final evaluation system was used to analyze the instructional design and evaluation process used at Advanced Systems, Incorporated.

A brief history of the ASI corporation was delineated in the initial segment of the dissertation. This data was de-


ANALYSIS OF EVALUATION REQUIREMENTS
Evaluation Problem
Define evaluation problem
Describe evaluation problem
Analysis of Evaluation Setting
needs assessment
focus evaluation
identify decision-making levels
identify goals
identify general
program components
identify what is versus
what should be
describe package components
Plan the Evaluation Activities
evaluate needs
project decision alternatives
develop decision criteria
define policies
Identify the following:
longitudinal effects
high payoff transactions
entry level behavior and
characteristics
prioritize need
select needs for action
abstract project
Determine intents from
planners
designers
developers
analyze the training environment


FROM ANALYSIS PHASE
DESIGN OF THE EVALUATION SYSTEM
Identify evaluation objectives
Audiences
Educational philosophy
Decisions
Subject matter
Rationales
Staff aims
Task Analysis
Subtasks into performance objectives
Criterion items
Course final exam
Construct course evaluation instrument
Determine curriculum outline
Sequence objectives
Select instructional materials
Determine terminal outcomes
Determine information stages
collection
organization
analysis
reporting
Determine statistical method
descriptive
predictive
ANOVA or ANCOVA
canonical correlation
multiple discriminant
path analytic
nonparametric


PRE-EVALUATION ACTIVITIES
Determine Evaluation dimensions
Review prior to evaluation
Conduct the following:
Self evaluation of material
Rough draft of material
Expert Appraisal
Complete internal review
Develop natural language questions
Check evaluation design criteria for:
pervasiveness
reliability
validity
credibility
timeliness


Administer initial evaluation:
one-to-one
pilot test
formative interim
Revise and Recycle
Conduct group trial
Conduct field-test
formative product
goal free
Prepare final form
scripts
storyboards
visuals
mastertape
Operational tryout
Analyze evaluation data
program outcomes
relationships and indicators
judgements
objectives met
unexpected results
utilization plan

rived from in-house documentation and Barnum (1979). The narrative reflected the rapid growth of ASI as a viable entity.

The next segment of the dissertation provided a detailed documentation of the ASI six-phase course development process. When necessary and apropos, appendices were added to provide further clarification and for easy reference. As in the preceding segment, the process was consolidated into a flowchart diagram of the events leading to course completion and implementation as shown in figure 4.

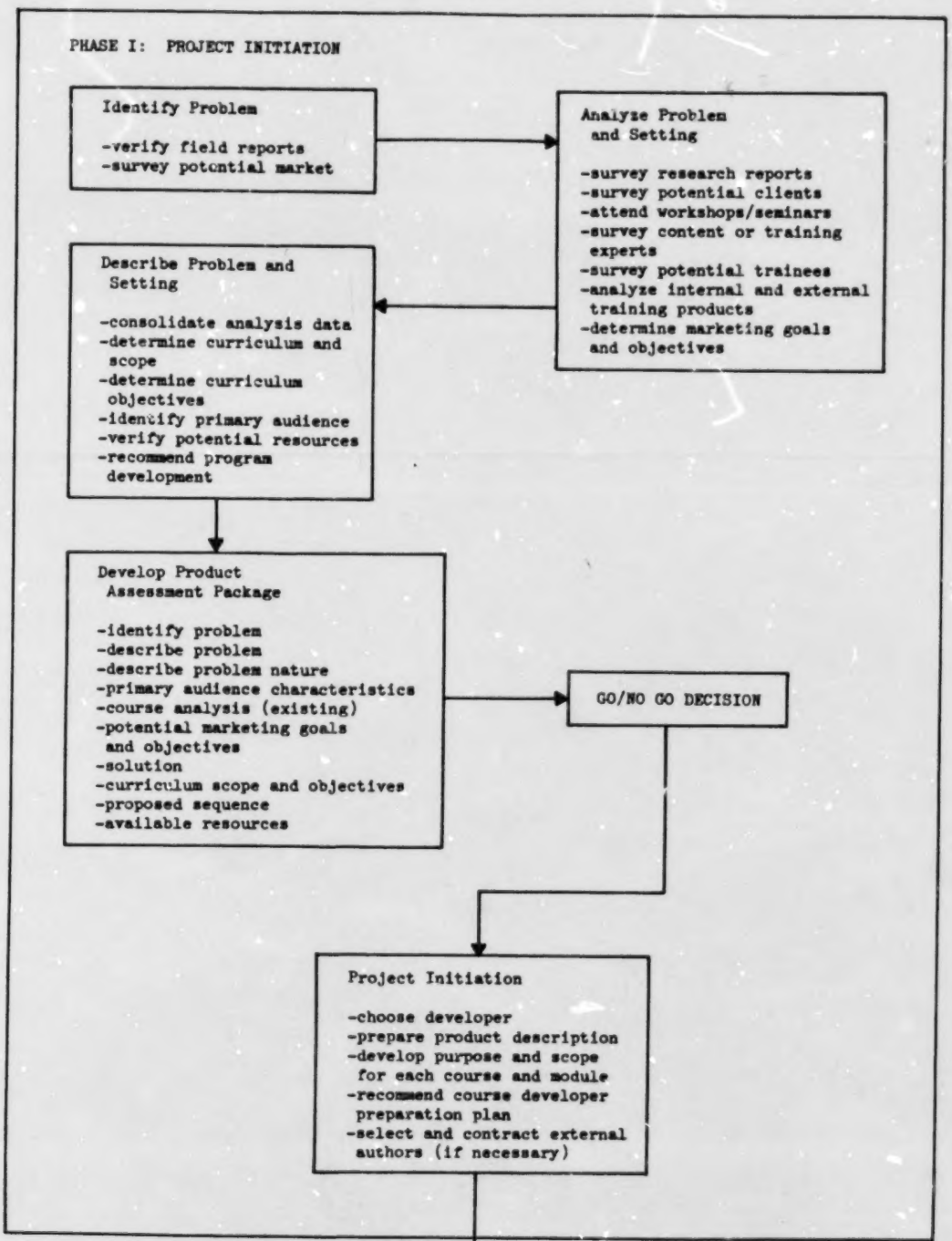
The final segment discussed the rationale, methodology and tabulated results of a questionnaire designed to further verify and evaluate the ASI model from an in-house perspective.

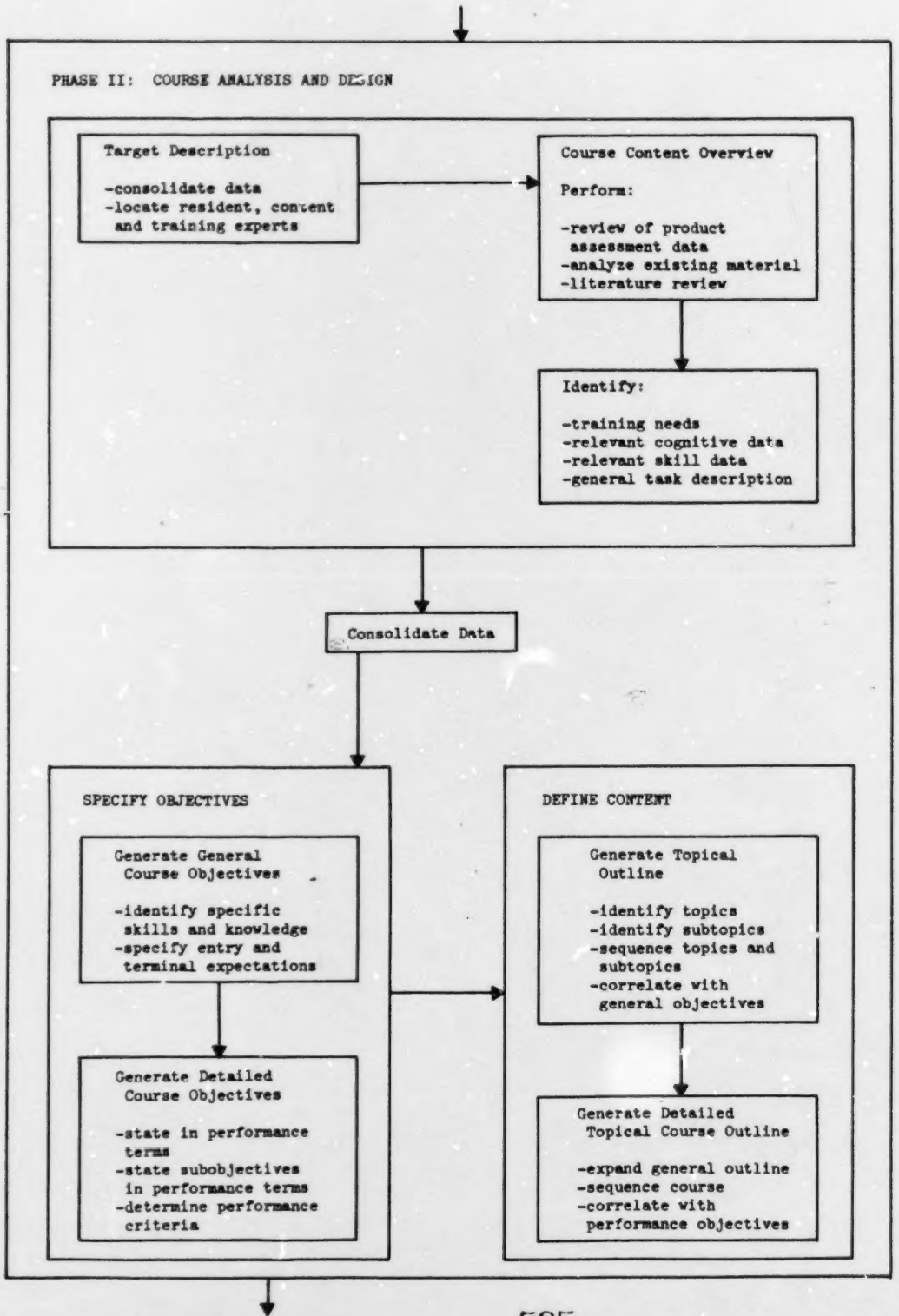
Conclusions

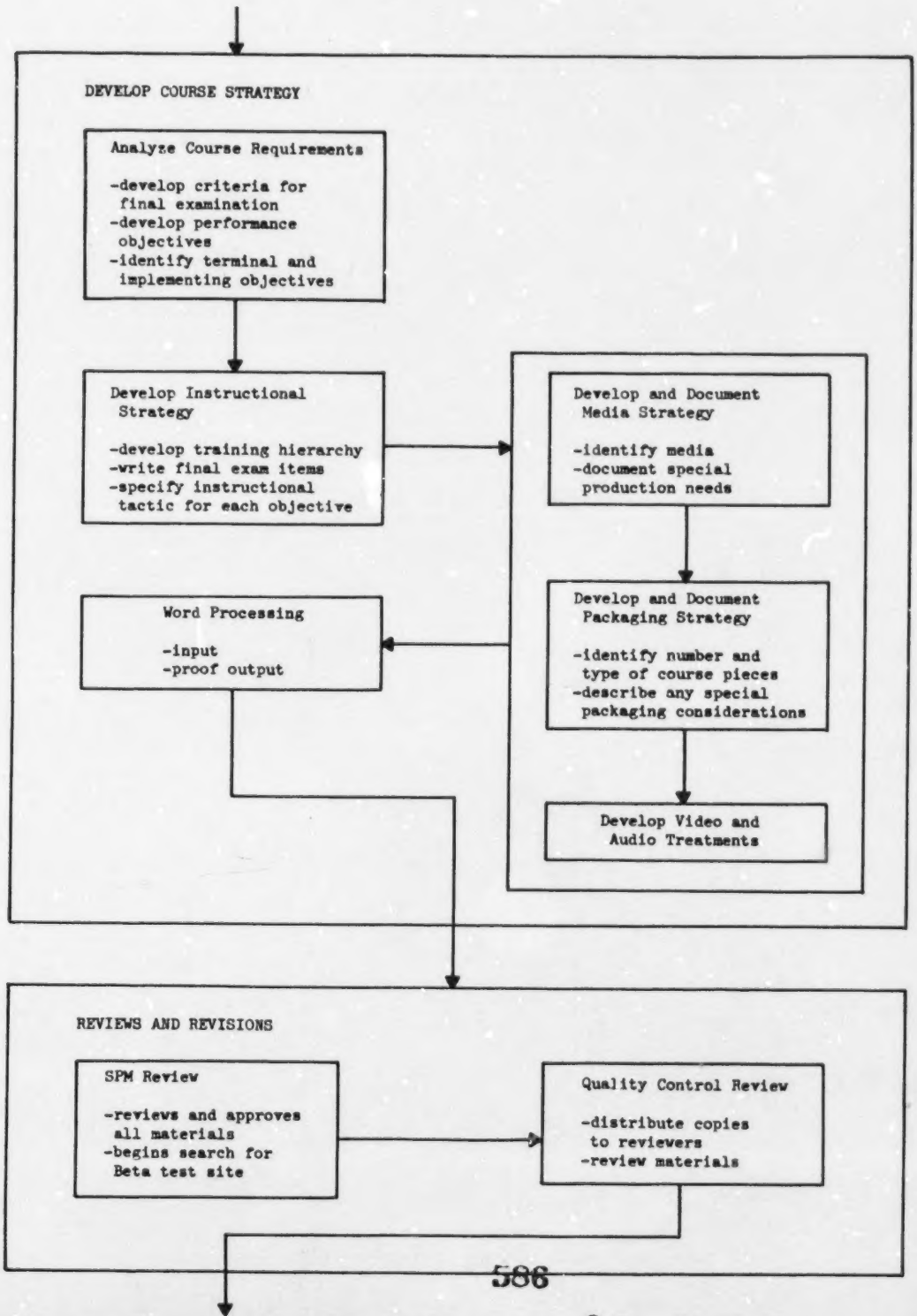
Nine conclusions were generated as a result of the investigation. Essentially, these are related to the state of the art of formative evaluation as delineated in Chapter II, the model derived from the theory, the ASI procedure and survey results described in Chapter III, and the comparison of the two models in Chapter IV of the dissertation.

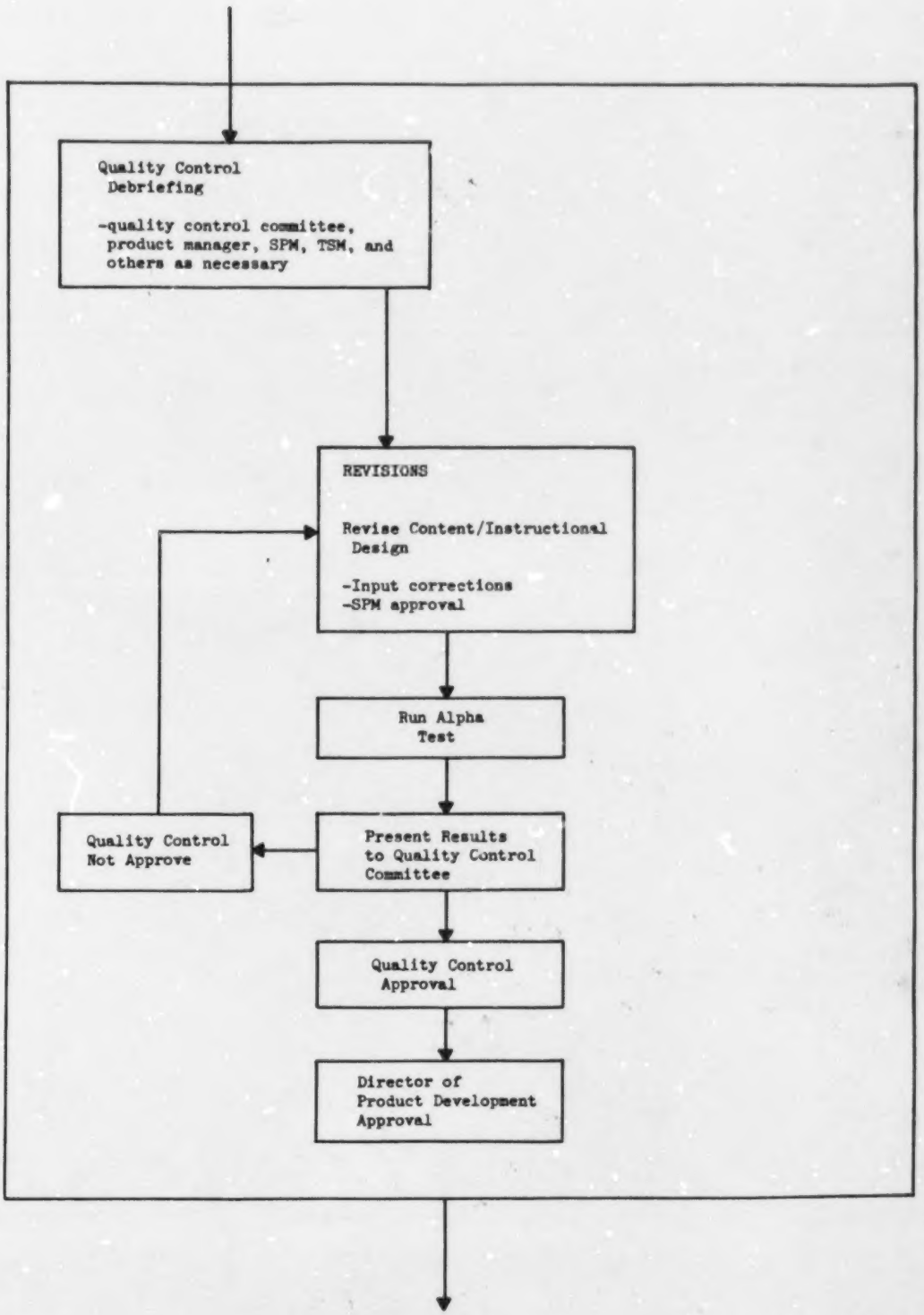
Formative Evaluation - State of the Art

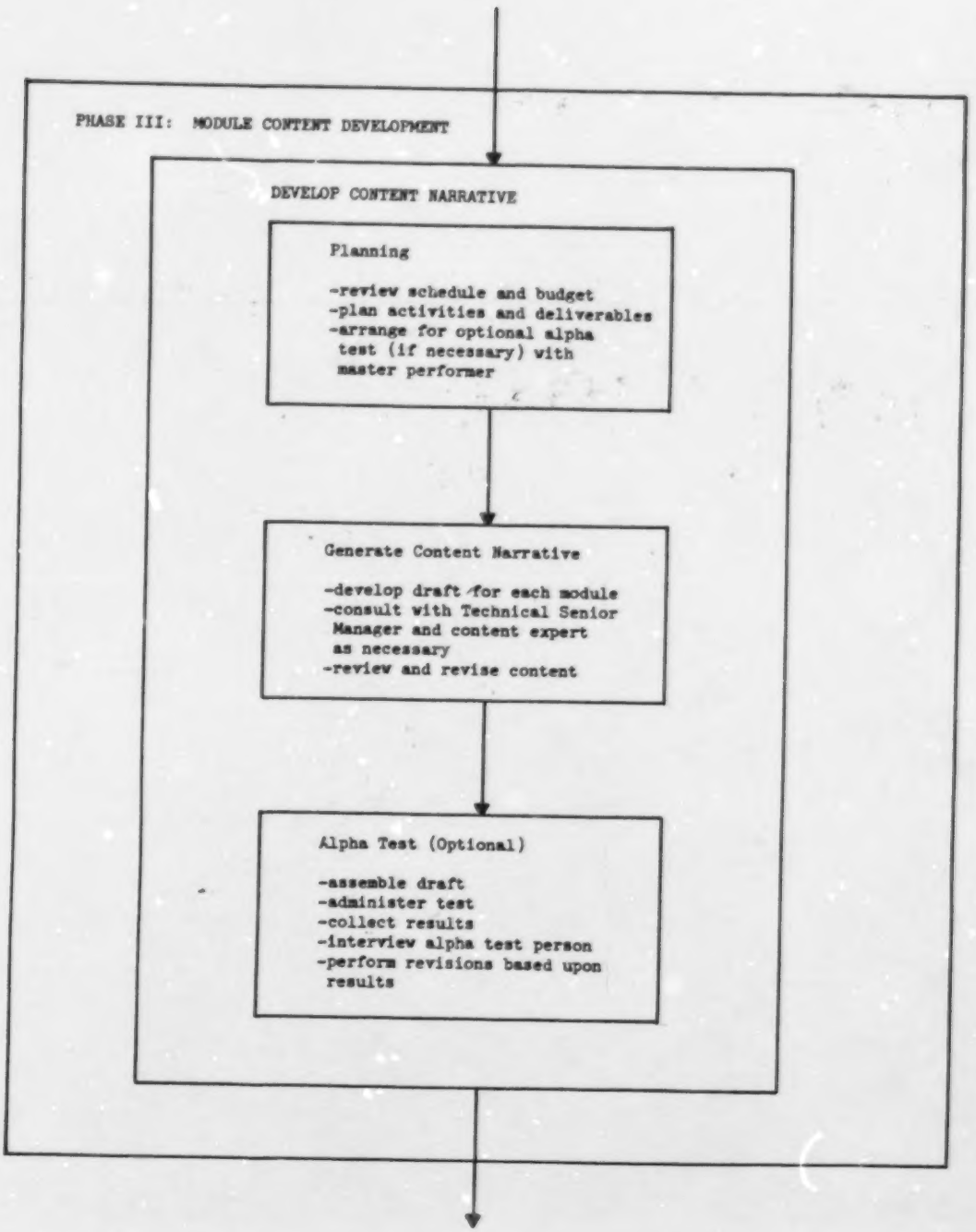
Four conclusions were generated from the literature review in Chapter II. They are as follows:

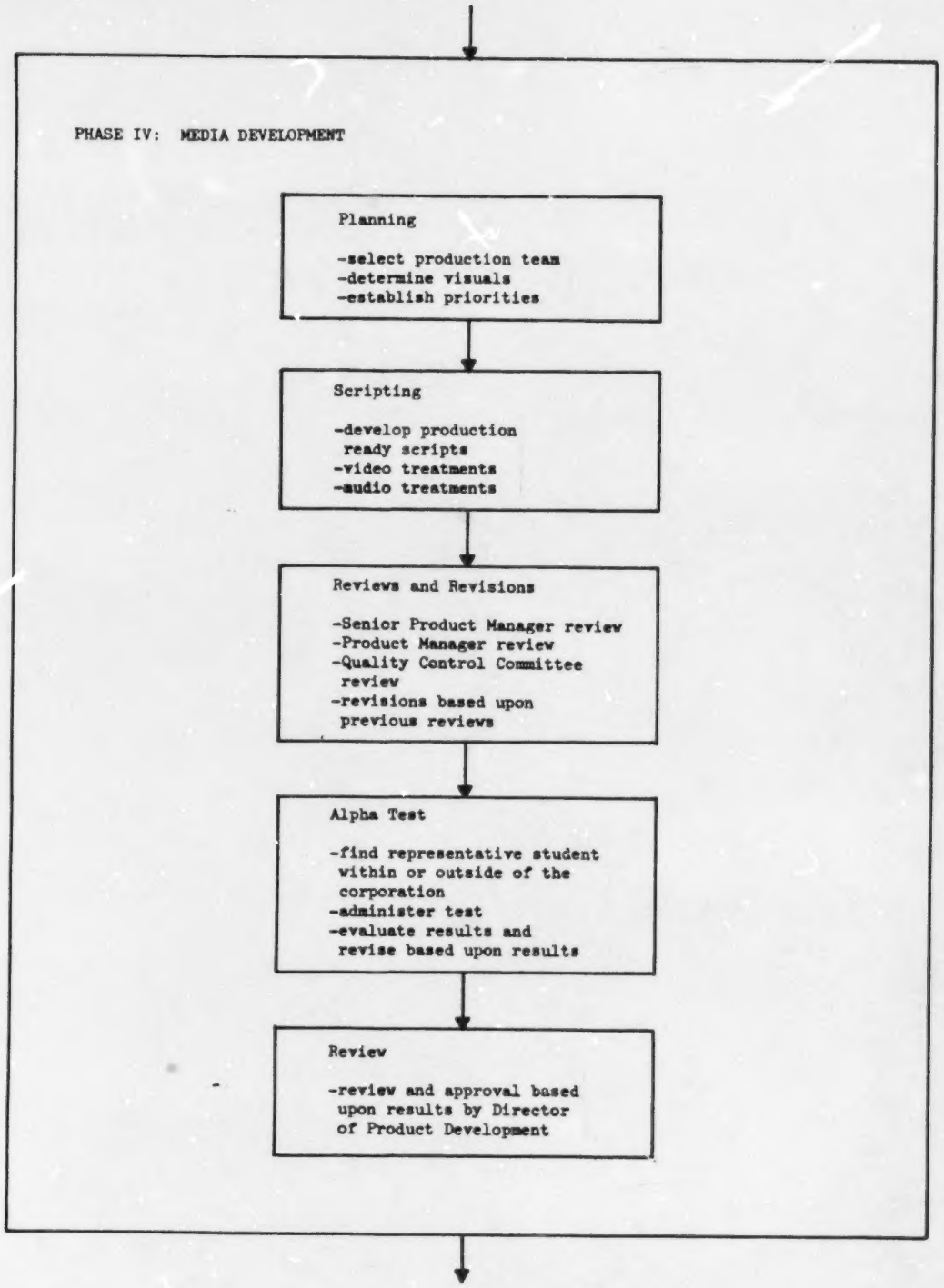

PHASE I: PROJECT INITIATION
Identify Problem
-verify field reports
-survey potential market
Analyze Problem and Setting
-survey research reports
-survey potential clients
-attend workshops/seminars
-survey content or training experts
-survey potential trainees
-analyze internal and external training products
-determine marketing goals and objectives
Describe Problem and Setting
-consolidate analysis data
-determine curriculum and scope
-determine curriculum objectives
-identify primary audience
-verify potential resources
-recommend program development
Develop Product Assessment Package
-identify problem
-describe problem
-describe problem nature
-primary audience characteristics
-course analysis (existing)
-potential marketing goals and objectives
-solution
-curriculum scope and objectives
-proposed sequence
-available resources
GO/NO GO DECISION
Project Initiation
-choose developer
-prepare product description
-develop purpose and scope for each course and module
-recommend course developer preparation plan
-select and contract external authors (if necessary)

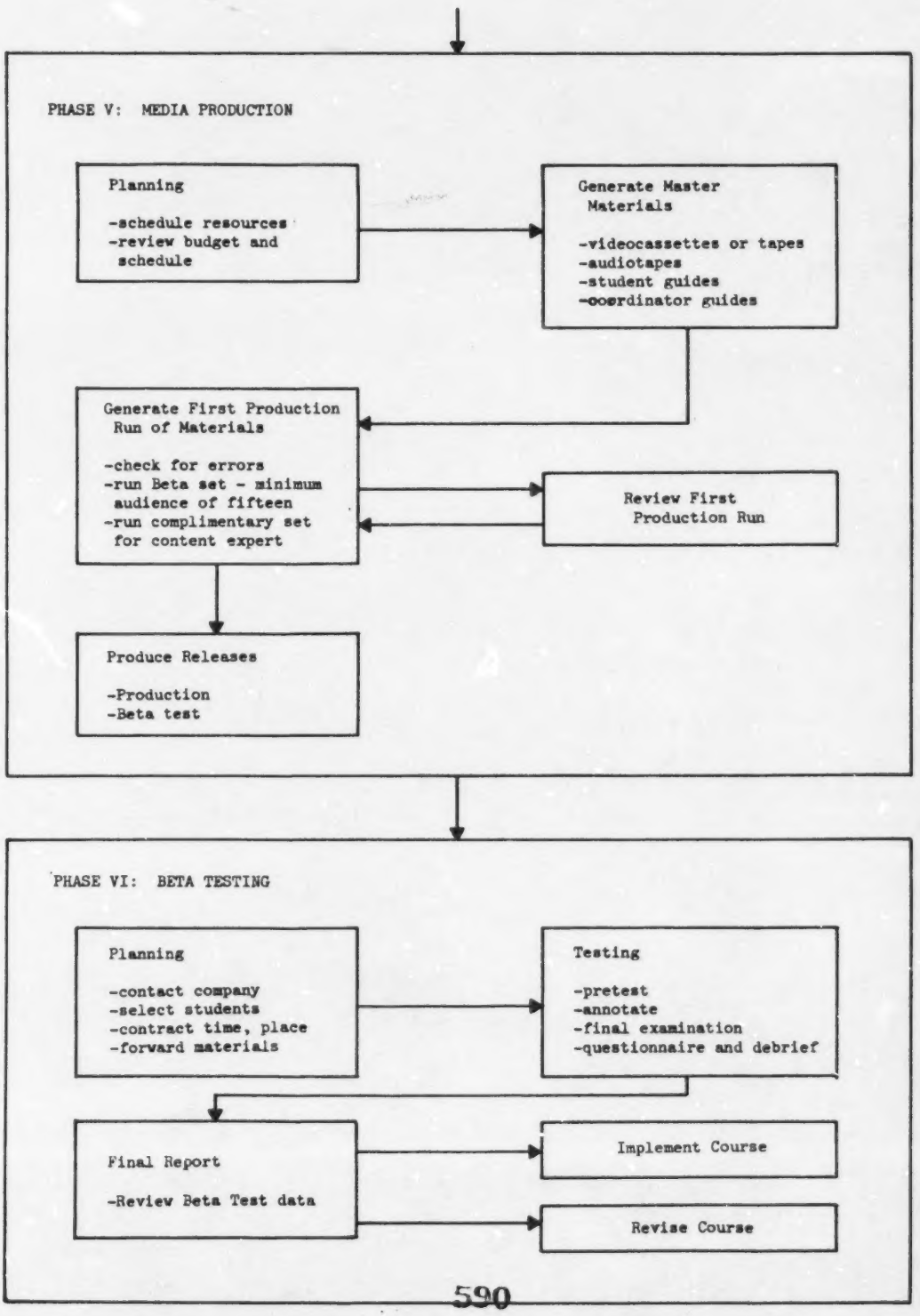

PHASE II: COURSE ANALYSIS AND DESIGN
Target Description
-consolidate data
-locate resident, content and training experts
Course Content Overview
Perform:
-review of product assessment data
-analyze existing material
-literature review
Identify:
-training needs
-relevant cognitive data
-relevant skill data
-general task description
Consolidate Data
SPECIFY OBJECTIVES
Generate General Course Objectives
-identify specific skills and knowledge
-specify entry and terminal expectations
Generate Detailed Course Objectives
-state in performance terms
-state subobjectives in performance terms
-determine performance criteria
DEFINE CONTENT
Generate Topical Outline
-identify topics
-identify subtopics
-sequence topics and subtopics
-correlate with general objectives
Generate Detailed Topical Course Outline
-expand general outline
-sequence course
-correlate with performance objectives


DEVELOP COURSE STRATEGY
Analyze Course Requirements
-develop criteria for final examination
-develop performance objectives
-identify terminal and implementing objectives
Develop Instructional Strategy
-develop training hierarchy
-write final exam items
-specify instructional tactic for each objective
Develop and Document Media Strategy
-identify media
-document special production needs
Develop and Document Packaging Strategy
-identify number and type of course pieces
-describe any special packaging considerations
Develop Video and Audio Treatments
Word Processing
-input
-proof output
REVIEWS AND REVISIONS
SPM Review
-reviews and approves all materials
-begins search for Beta test site
Quality Control Review
-distribute copies to reviewers
-review materials


Quality Control
Debriefing
-quality control committee, product manager, SPM, TSM, and others as necessary
REVISIONS
Revise Content/Instructional Design
-Input corrections
-SPM approval
Run Alpha Test
Present Results to Quality Control Committee
Quality Control Not Approve
Quality Control Approval
Director of Product Development Approval


PHASE III: MODULE CONTENT DEVELOPMENT
DEVELOP CONTENT NARRATIVE
Planning
-review schedule and budget
-plan activities and deliverables
-arrange for optional alpha test (if necessary) with master performer
Generate Content Narrative
-develop draft for each module
-consult with Technical Senior Manager and content expert as necessary
-review and revise content
Alpha Test (Optional)
-assemble draft
-administer test
-collect results
-interview alpha test person
-perform revisions based upon results


PHASE IV: MEDIA DEVELOPMENT
Planning
-select production team
-determine visuals
-establish priorities
Scripting
-develop production ready scripts
-video treatments
-audio treatments
Reviews and Revisions
-Senior Product Manager review
-Product Manager review
-Quality Control Committee review
-revisions based upon previous reviews
Alpha Test
-find representative student within or outside of the corporation
-administer test
-evaluate results and revise based upon results
Review
-review and approval based upon results by Director of Product Development


PHASE V: MEDIA PRODUCTION
Planning
-schedule resources
-review budget and schedule
Generate Master Materials
-videocassettes or tapes
-audiotapes
-student guides
-coordinator guides
Generate First Production Run of Materials
-check for errors
-run Beta set - minimum audience of fifteen
-run complimentary set for content expert
Review First Production Run
Produce Releases
-Production
-Beta test
PHASE VI: BETA TESTING
Planning
-contact company
-select students
-contract time, place
-forward materials
Testing
-pretest
-annotate
-final examination
-questionnaire and debrief
Final Report
-Review Beta Test data
Implement Course
Revise Course

1. Formative evaluation theory was based upon the audiovisual instruction movement of the 1920's and the psychometric movement of the 1930's.

2. Practical uses of formative evaluation was derived from research conducted in the armed forces during World War II.

3. Formative evaluation theory models were not developed until the late 1960's.

4. The industrial and military domains did not provide many models of formative evaluation.

The ASI Process and Model

The fifth and sixth conclusions were based upon the results of Chapter III. They are as follows:

5. The ASI model reflected the corporation's desire to present a systematic approach to the development and evaluation of training materials.

6. The employees of ASI did not always agree with ASI's method of course development and evaluation based upon the results of the survey detailed in Chapter III.

The Theory Model/ASI Model Comparison

The seventh, eighth, and ninth conclusions are based upon the comparison of the theory model in Chapter II and the ASI model in Chapter III. The three conclusions are as follows:

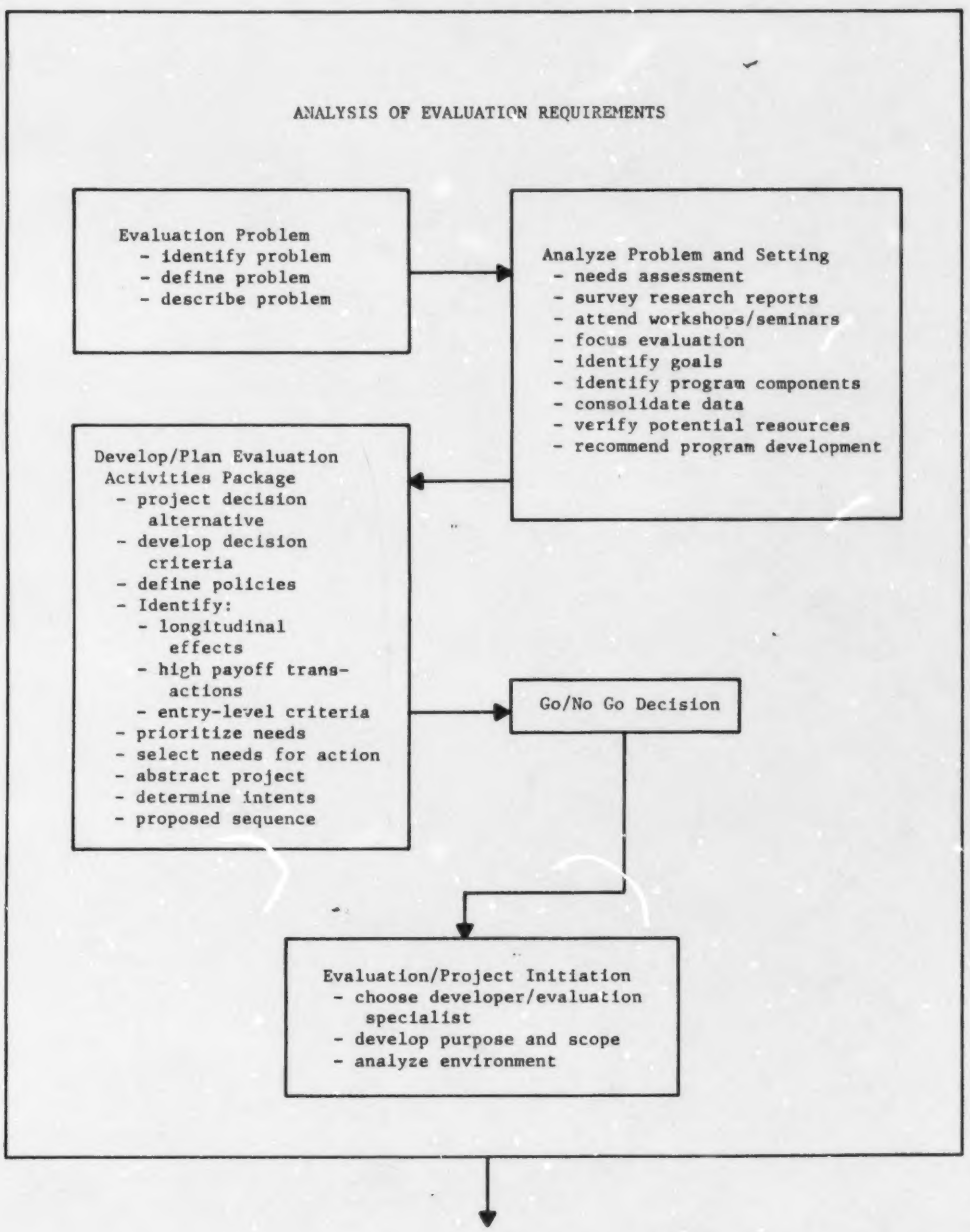
7. On the basis of the findings in Chapter IV, the theory model could have benefitted from interface with the ASI model. The Go/No Go decision point in the ASI model was one of the more significant areas in which the theory model would receive substantial benefit. A second benefit found in the ASI model, but not in the theory, is the step of identifying needs.

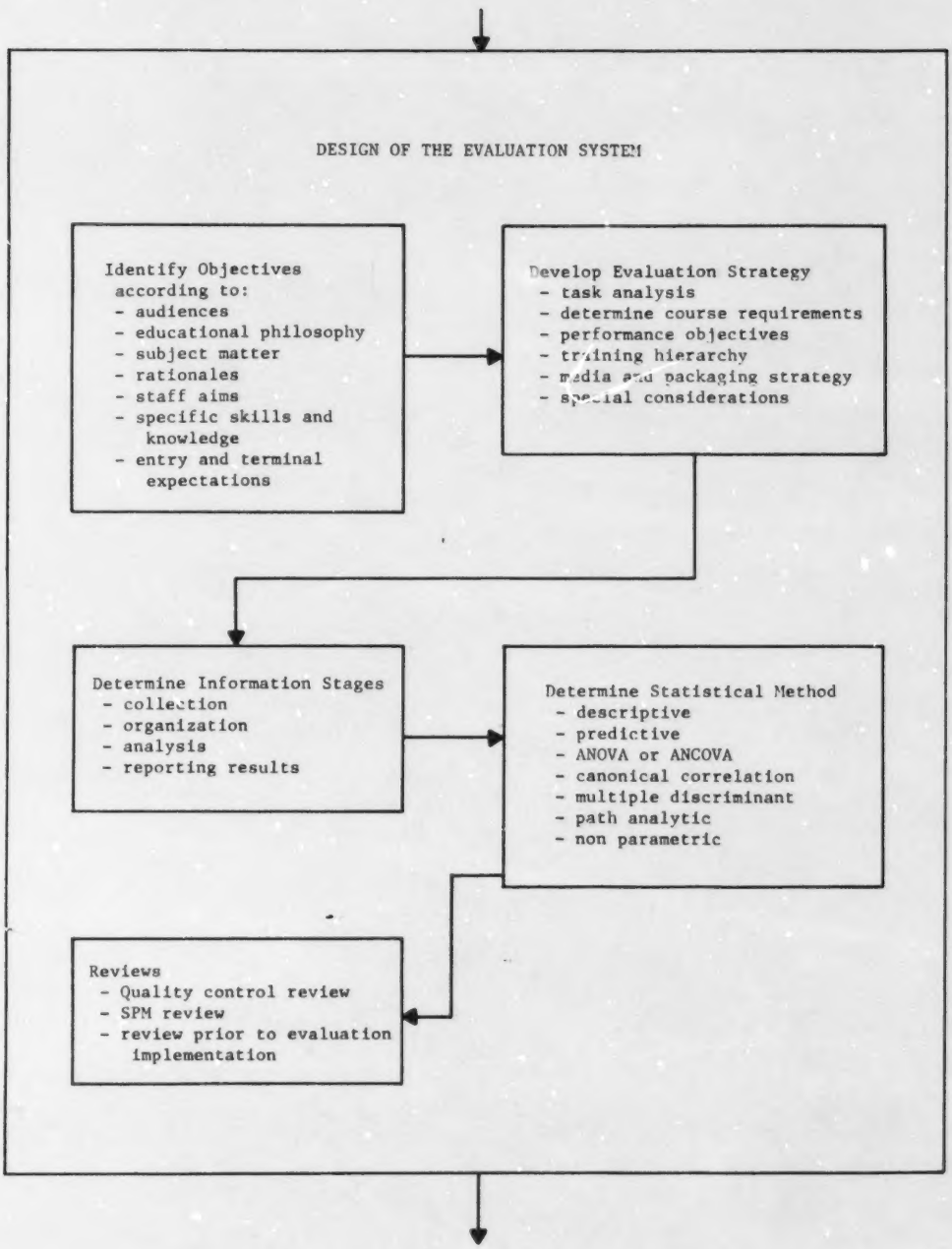
8. Another conclusion gleaned from the results of Chapter IV was that the theory model and the ASI model were similar in significant areas. This was most apparent in the implementation and evaluation stage, as the steps followed in each of the models were roughly equivalent to one another.

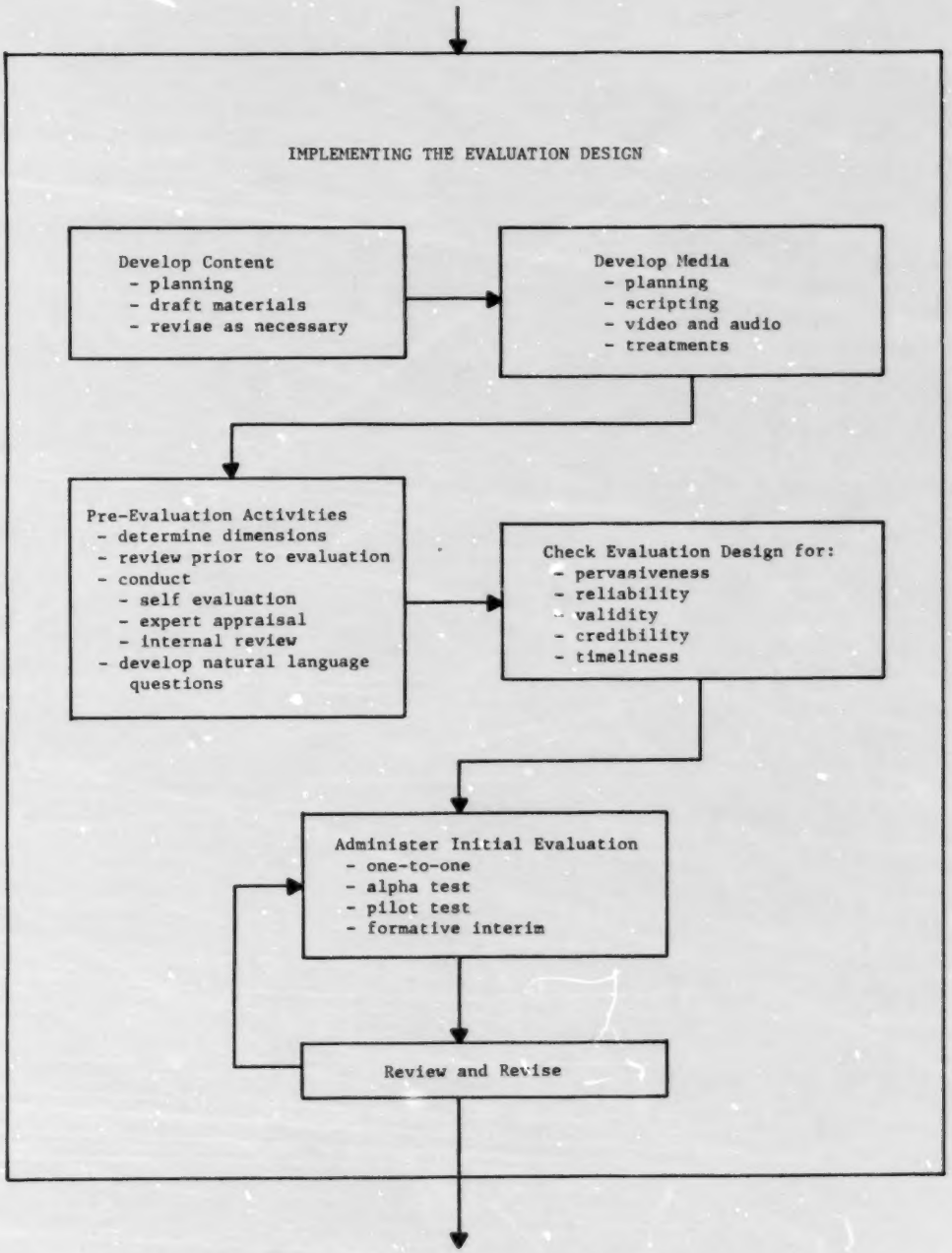
9. The ninth conclusion of this study concerned the ASI design. Based upon the results of Chapter IV, there were a number of steps within the ASI model which could have benefitted from the formative evaluation theory model.

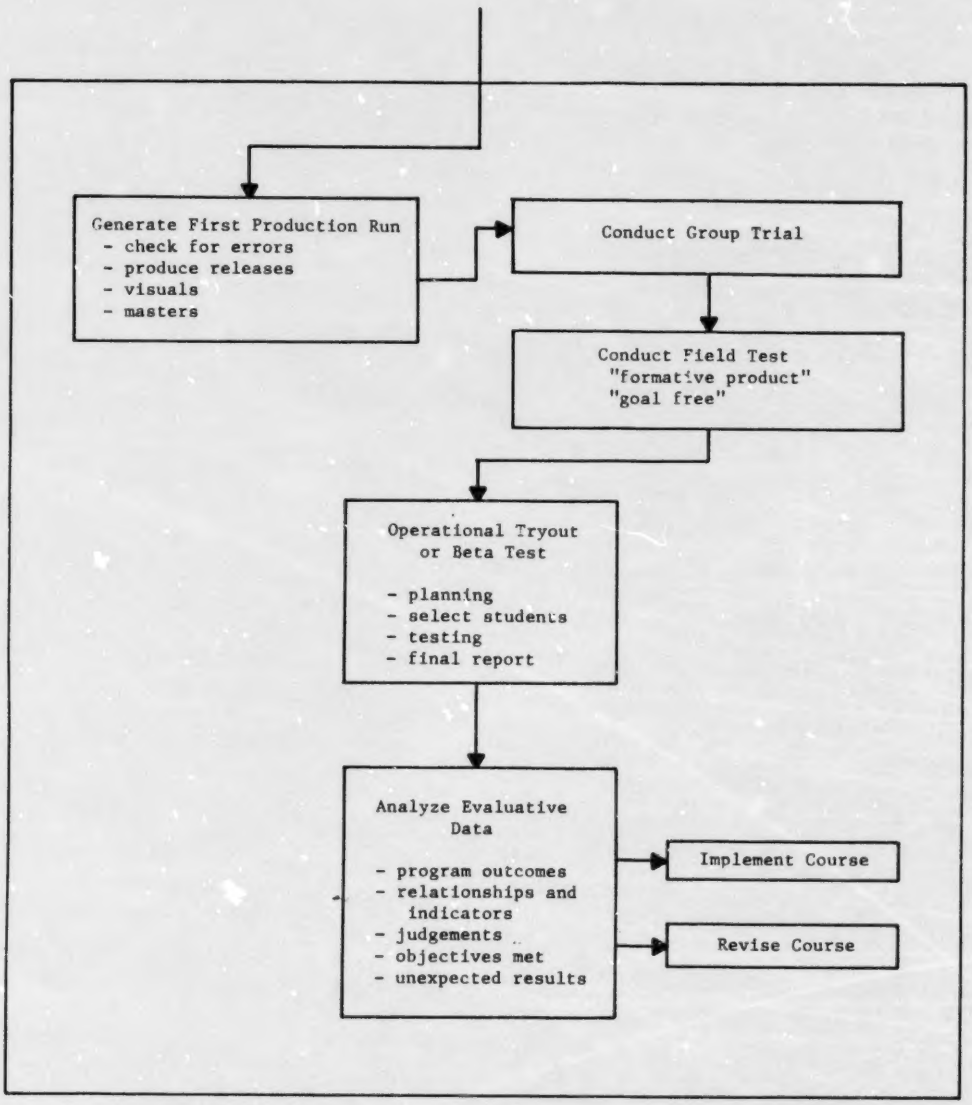
The Combined Formative Evaluation Model (CFEM)

Using the data and incorporating the above conclusions, a combination of the theory model and the ASI model was developed. The result is shown in Figure 5. The advantage of this model is that it is based on research theory and proven applicability in the field.


ANALYSIS OF EVALUATION REQUIREMENTS
Evaluation Problem
- identify problem
- define problem
- describe problem
Analyze Problem and Setting
- needs assessment
- survey research reports
- attend workshops/seminars
- focus evaluation
- identify goals
- identify program components
- consolidate data
- verify potential resources
- recommend program development
Develop/Plan Evaluation Activities Package
- project decision alternative
- develop decision criteria
- define policies
- Identify:
- longitudinal effects
- high payoff transactions
- entry-level criteria
- prioritize needs
- select needs for action
- abstract project
- determine intents
- proposed sequence
Go/No Go Decision
Evaluation/Project Initiation
- choose developer/evaluation specialist
- develop purpose and scope
- analyze environment


DESIGN OF THE EVALUATION SYSTEM
Identify Objectives according to:
- audiences
- educational philosophy
- subject matter
- rationales
- staff aims
- specific skills and knowledge
- entry and terminal expectations
Develop Evaluation Strategy
- task analysis
- determine course requirements
- performance objectives
- training hierarchy
- media and packaging strategy
- special considerations
Determine Information Stages
- collection
- organization
- analysis
- reporting results
Determine Statistical Method
- descriptive
- predictive
- ANOVA or ANCOVA
- canonical correlation
- multiple discriminant
- path analytic
- non parametric
Reviews
- Quality control review
- SPM review
- review prior to evaluation implementation


IMPLEMENTING THE EVALUATION DESIGN
Develop Content
- planning
- draft materials
- revise as necessary
Develop Media
- planning
- scripting
- video and audio
- treatments
Pre-Evaluation Activities
- determine dimensions
- review prior to evaluation
- conduct
- self evaluation
- expert appraisal
- internal review
- develop natural language questions
Check Evaluation Design for:
- pervasiveness
- reliability
- validity
- credibility
- timeliness
Administer Initial Evaluation
- one-to-one
- alpha test
- pilot test
- formative interim
Review and Revise


Generate First Production Run
- check for errors
- produce releases
- visuals
- masters
Conduct Group Trial
Conduct Field Test
"formative product"
"goal free"
Operational Tryout
or Beta Test
- planning
- select students
- testing
- final report
Analyze Evaluative
Data
- program outcomes
- relationships and
indicators
- judgements
- objectives met
- unexpected results
Implement Course
Revise Course

Recommendations for Use

The results of this study yielded three recommendations for future research or applications. They are as follows:

1. One recommendation for use of the results would be that the historical development presented in Chapter II provides an immediate understanding of formative evaluation. Enough information was provided to enable the researcher or practitioner to have a solid understanding of the formative evaluation process and its roots in the educational, industrial and military domains.

2. A second recommendation for use of this study would follow the comparison and contrast of representative systems. Initially, a move toward standardizing the terms and process of formative evaluation could be established. Secondly, existing or future systems could be compared with or modified by the formative evaluation theory model developed in Chapter II.

3. A third recommendation for future use of the study would be to use the results of Chapter II as a text in an evaluation curriculum or course for curriculum developers, curriculum evaluators, instructional design specialists, or anyone involved in the production of instructional packages.

Recommendations for Future Research

The directions of future research in terms of this particular study are many and varied. These may be taken as bases for research in the theoretical as well as the practical domains.

1. The most important direction for future research would be to perform a formative evaluation of any instructional program or package with the combined model presented in Chapter V.

2. Secondly, the theoretical model developed in Chapter II may provide the basis for additional comparisons with the formative evaluation procedures presented in other future models. This would only enhance the literature available on formative evaluation.

3. Thirdly, another direction for further research would to be to design and execute a cost/benefit experimental study involving the theoretical model in Chapter II or the combined model in Chapter V. This would determine whether the added expense of formative evaluation is worth the cost.

4. A fourth area of potential study would be to expand and/or modify the theoretical model presented in Chapter II as well as the combined model presented in Chapter V. This would coincide with establishing a standard formative evaluation model suitable for use in a variety of settings.

5. A fifth area of potential study would be to compare and contrast the formative evaluation procedures of other corporations involved in producing training packages with the theoretical model developed in Chapter II.

REFERENCES

Abedor, A.J. Second draft technology: Development and field test of a model for formative evaluation of self-instructional multi-media learning systems. Indiana University. School of Education. Viewpoints. July 1972, 48(4), 9-43.

Advanced Systems, Incorporated. Annual Report, 1980, 2.

Advanced Systems Incorporated Product Catalog, 1982. Elk Grove Village, Illinois: Advanced Systems, Incorporated, 1982.

Ary, D., Jacobs, L.C., and Razavieh, A. Introduction to research in education. New York: Holt, Rinehart and Winston, Inc., 1972.

Association for Educational Communications and Technology. Educational technology: Definition and glossary of terms. Washington, D.C.: Association for Educational Communications and Technology, 1977.

Averna, F.M. and Forman, D.C. Issues in the evaluation of educational television programs. NSPI Journal, March 1978, 17(2), 16-18.

Baker, E.L. Formative evaluation of instruction. In W.J. Popham (Ed.), Evaluation in education: current applications. Berkeley, California: McCutchan Publishing Corporation, 1974.

Bank, A. and Fink, A. Planning and evaluating performance-based teacher education: Using CSE's evaluation model. CEDR Quarterly, 1976, 9(2) 4-9.

Barnum, P.M. An analysis of instructional systems design as reflected in formal education, industry and military institutions: Theory vs. application (Doctoral dissertation, Northern Illinois University, 1979). Dissertation Abstracts International, 1979, 40, 3061A. (University Microfilms No. 7924367)

Blalock, H.M., Jr. Causal inferences in non-experimental research. Chapel Hill, North Carolina: University of North Carolina Press, 1964

Borich, G.D. A systems approach to the evaluation of training. In H.F. O'Neil (Ed.), Procedures for instructional systems development. New York: Academic Press, 1979.

Borich, G.D. (Ed.) Evaluating educational programs and products. Englewood Cliffs, New Jersey: Educational Technology Publications, 1974.

Borich, G.D. and Drezek, S.F. Evaluating instructional transactions. In G.D. Borich (Ed.), Evaluating educational programs and products. Englewood Cliffs, New Jersey: Educational Technology Publications, 1974.

Branson, R.K., Raynor, G.T., Coe, J.E., Furman, J. P., King, F.J. and Hannum, W.H. Interservice procedures for instructional systems development. Tallahassee: Center for Instructional Technology. Florida State University, 1975.

Braybrooke, D. and Lindblom, C.E. A strategy of decision. New York: The Free Press, 1963.

Briggs, L.J. Handbook of procedures for the design of instruction. Pittsburgh: American Institutes for Research, 1970.

Briggs, L.J. (Ed.) Instructional design: Principles and applications. Englewood Cliffs, New Jersey: Educational Technology Publications, 1974.

Briggs, L.J. and Gagne, R.M. Principles of instructional design. New York: Holt, Rinehart and Winston, Inc. 1974.

Buros, O.K. The sixth mental measurements yearbook. Highland Park, New Jersey: Gryphon, 1965.

Cambre, M. A. The development of formative evaluation procedures for instructional film and television: The first fifty years (Doctoral dissertation, Indiana University, 1978). Dissertation Abstracts International, 1979 39, 3995A. (University Microfilms No. 7900379)

Cronbach, L.J. Course improvement through evaluation. Teachers College Record, May 1963, 64(8), 672-683.

Dick, W. A methodology for the formative evaluation of instructional materials. Journal of Educational Measurement, Summer 1968, 5(2), 99-102.

Dick, W. and Carey, L. The systematic design of instruction. Glenview Illinois: Scott, Foresman and Company, 1978.

Dubois, P.H. A history of psychological testing. Boston: Allyn and Bacon, 1970.

Gephart, W.J. Editorial. CEDR Quarterly, 1976, 9(4), 2.

Goodman, D.J. Criteria for the production and selection of visual aids. Education, 1941, 44, 97-104.

Greenhill, L.P. Review of trends in research on instructional television and film. In C. Reid and D.W. MacLennon (Eds), Research in instructional television and film. Washington, D.C.: Government Printing Office, 1967.

Gryde, S.K. The feasibility of "programmed" television instruction. AV Communication Review, 1960, 14, 71-89.

Hoban, C.F. Experimental research in instructional films. In E. Dale, F.M. Dunn, C.F. Hoban, and E. Schneider (Eds.), Motion pictures in education. New York: H.W. Wilson Company, 1938.

Hoban, C.F. Focus on learning: Motion pictures in the school. Washington, D.C.: American Council on Education, 1942.

Hoban, C.F. Movies that teach. New York: Dryden Press, 1946.

Hovland, C.I., Lumsdaine, A.A., and Sheffield, F.D. Experiments in mass communication. Princeton University Press, 1949.

Isaac, S. and Michael, W.B. Handbook in research and evaluation. (2nd edition). San Diego: Edits Publishers, 1979.

Johnson, G.C. The application of military audio-visual techniques to civilian teaching. Educational Screen, 1946, XXV, 233-235, 295-296.

Joint Committee on Standards for Educational Evaluation. Standards for evaluation of educational programs, projects and materials. New York: McGraw-Hill Book Company, 1981.

Kaufman, R.I. and Thomas, S.B. Evaluation without tears. New York: New Viewpoints, 1980.

Kerlinger, F.N. Foundations of behavioral research. (2nd edition) New York: Holt, Rinehart and Winston, Inc., 1973.

Kirkpatrick, D.L. (compiler) Evaluating training programs. Madison, Wisconsin: American Society for Training and Development, 1975.

Komoski, P.K. A demonstration project of programmed television instruction. Conducted by the Institute of Educational Technology, Teachers College, Columbia University with NETA-TV Washington, D.C., July 1966.

Komoski, P.K. An imbalance of product quantity and instructional quality: The imperative of empiricism. ERIC/AVCR Annual Review Paper. AV Communication Review, 1974, 22, 357-386.

Krathwohl, D.R. The taxonomy of educational objectives -- use of cognitive and affective domains. In C.M. Lindvall (Ed.), Defining educational objectives. Pittsburgh: University of Pittsburgh Press, 1964.

Light, B.A. and Reynolds, L.J. Debugging product and testing errors. Viewpoints, 1972, 48(4), 45-48.

Lindvall, C.M. and Cox, R.C. Evaluation as a tool in curriculum development: The IPI evaluation program. In AERA monograph series on curriculum evaluation, no. 5. Chicago: Rand McNally, 1970.

Markle, S.M. Empirical testing of programs in programmed instruction: The sixty-sixth yearbook of the National Society for the Study of Education part II. Chicago: The University of Chicago Press, 1967.

Martelli, M. A study of a theory-based model of formative evaluation. (Doctoral dissertation, The Florida State University, 1979) Dissertation Abstracts International, 1979, 40, 3089A. (University Microfilms No. 7926785)

Partlow, J. Personal communication. January 20, 1982. Elk Grove Village, Illinois: Advanced Systems, Incorporated.

Popham, W.J. Curriculum materials. Review of Educational Research, June 1970, 39(3), 319-337.

Procedures for the planning, design, development, and management of Navy technical training courses. Millington, Tennessee: Naval Air Station Memphis, Department of the Navy, Chief of Naval Technical Training, April, 1976.

Roberts, A.K. A manhattan project in educational technology, part II. JSAS Catalog of Selected Documents in Psychology, 1976, 6(4), 120.

Saettler, P. A history of instructional technology. New York: McGraw-Hill Book Company, 1968.

Sanders, J.R. and Cunningham, D.J. A structure for formative evaluation in product development. Review of Educational Research, Spring 1973, 43(2), 217-233.

Scriven, M. The methodology of evaluation. In R. Tyler, R. Gagne, M. Scriven (Eds.) Perspectives in curriculum evaluation. AERA monograph series on evaluation, no. 1. Chicago: Rand McNally and Company, 1967.

Scriven, M. Pros and cons about goal-free evaluation. Evaluation Comment, 1972, 3, 1-4.

Silvern, L.C. Systems engineering applied to training. Houston: Gulf Publishing Company, 1972.

Singer, R.N. and Dick, W. Teaching physical education: a system's approach. Boston: Houghton Mifflin, Co., 1974.

Stake, R.I. The countenance of educational evaluation. Teachers College Record, April 1967, 68(7), 523-540.

Steinmetz, A. The ideology of educational evaluation. Educational Technology, May 1975, 15 (5), 51-58.

Stolovitch, H.D. How to produce audiovisual training modules: Evaluating your product. NSPI Journal, July 1976, 15(7), 51-58.

Taylor, P.A. and Cowley, D.M. Readings in curriculum evaluation. Dubuque, Iowa: William C. Brown Company, 1972.

Thurstone, L.L. What is an educational motion picture? Visual Education, 1920, 1(2), 24-28.

Twyford, L.C. A comparison of methods of measuring profiles of learning from instructional films (Doctoral dissertation, Pennsylvania State University, 1951). Dissertation Abstracts International. (University Microfilms No. 3314)

Tyler, R.W. General statement on evaluation. Journal of Educational Research, March 1942, 35(7), 492-501.

Walberg, H.J. Curriculum evaluation: Problems and guidelines. Teachers College Record, 1970, 71, 551-570.

Westgaard, O. A systematic method for developing courses at Advanced Systems, Incorporated. Elk Grove Village, Illinois: Advanced Systems, Incorporated, 1980.

Westgaard, O. Personal communication, July 7, 1981. Elk Grove Village: Advanced Systems Incorporated, 1981.

Wilkinson, G.I. Needed: Information for cost analysis. Bloomington, Indiana: Indiana University, School of Education, September, 1971.

Worthen, B.R. and Sanders, J.A. Educational evaluation: Theory and practice. Worthington, Ohio: Charles A. Jones Publishing Company, 1973.

Wright, W.J. and Hess, R.J. A criteria acquisition model for educational product evaluation. In G.D. Borich (Ed.), Evaluating educational programs and products. Englewood Cliffs, New Jersey: Educational Technology Publications, 1974.